

San Joaquin Valley Air Pollution Control District

District Policy SSP 1835

Source Testing and Monitoring for Tier 4F Compliant Emergency IC Engines

Approved By: 
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 Director of Permit Services

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I. Purpose

To identify pre-approved monitoring and source testing procedures that can be used to verify Best Available Control Technology (BACT) requirements are satisfied for Tier 4 Final Compliant Emergency IC Engines.

II. Applicability

This policy applies to Tier 4 Final (4F) compliant emergency internal combustion engines to demonstrate compliance with BACT requirements of District Rule 2201 - New and Modified Stationary Source Review (NSR) Rule.

III. Summary of Source Testing and Monitoring Requirements

Tier 4 Final Certified IC Engines: No Testing or Monitoring Requirements
OEM Tier 4 Final Compliant IC Engines: No Testing or Monitoring Requirements
3rd Party Retrofit Tier 4F Compliant Engine: See Table 1 below

Table 1

Pollutant	Testing Requirements	Ongoing Monitoring Requirements
NOx, CO	Initial testing at representative load	Portable analyzer monitoring at representative load every 12 months
VOC	Initial testing at representative load	None
PM10	<u>Equipped with non-CARB certified DPF:</u> Initial testing at representative load <u>Equipped with CARB-certified DPF:</u> None	Operate and maintain DPF according to manufacturer's recommendations
SOx	None	None

IV. Background

Tier 4 Final Compliant Engines

In order to comply with Best Available Control Technology (BACT) Guideline 3.1.1 [Emergency Diesel-Fired IC Engine > 50 bhp Powering an Electrical Generator], updated on April 29, 2022, applicants are required to utilize engines that have an EPA Tier 4 Final certification level or equivalent for applicable horsepower range.

To meet BACT Guideline 3.1.1 requirements, applicants may propose a lower tier certified engine (e.g. Tier 3, Tier 2, etc.) that has been retrofitted with the appropriate add-on emission control technologies in order to meet emission levels that are equivalent to EPA Tier 4F certification levels for the applicable horsepower range. Such a retrofitted engine is referred to as a Tier 4F Compliant Engine, and may be separated into two categories:

- Original Equipment Manufacturer (OEM) Tier 4F Compliant Engines
- Third Party Retrofit Tier 4F Compliant Engines

Applicants who propose the installation of such a retrofitted engine must demonstrate that the proposed engine and emissions control package can achieve emission levels that are equivalent to EPA Tier 4F certification emission levels for the applicable horsepower range in order to satisfy District Rule 2201 BACT requirements. This policy will address source testing and monitoring requirements for both types of Tier 4F Compliant Engines.

V. Definitions

The following definitions are applicable to this policy:

California Air Resources Board (CARB) Certified DPF: An exhaust after treatment device used to control particular matter and soot from the exhaust of diesel engines that has been verified by CARB to achieve a PM control of Level 3. A list of CARB Level 3 verified DPFs can be found here: <https://ww2.arb.ca.gov/diesel/verdev/vt/cvt.htm>.

Certified Compression-Ignited Engine: a Tier 1, Tier 2, Tier 3, or Tier 4 compression-ignited engine that is EPA certified as specified in Title 40 Code of Federal Regulations Part 89 or in Title 40 Code of Federal Regulations Part 1039.

Compliant Engine: A manufactured engine that has been tested and proven to meet the emission levels and requirements of all applicable rules, but is not ARB or EPA certified.

Compression-Ignited Internal Combustion Engine: an engine that uses the heat of compression to initiate combustion.

Diesel Engine Inducements: Programed failsafe used to ensure engines are not operating with improperly functioning emission controls. An engine with inducements is programmed to shut down after a specific amount of time after the engine detects improperly functioning controls. Inducements are required for Tier 4F certification.

Diesel Exhaust Fluid (DEF): A fluid solution that is injected into the exhaust stream of a diesel engine utilizing an SCR system in order to reduce created pollution. Primary reducing agents utilized in DEF are urea or ammonia.

Diesel Particulate Filter (DPF): An exhaust after treatment device used to control particular matter and soot from the exhaust of diesel engines.

Emergency Standby Engine: an internal combustion engine which operates as a temporary replacement for primary mechanical or electrical power during an unscheduled outage caused by sudden and reasonably unforeseen natural disasters or sudden and reasonably unforeseen events beyond the control of the operator. An engine shall be considered to be an emergency standby engine if it is used only for the following purposes: (1) periodic maintenance, periodic readiness testing, or readiness testing during and after repair work; (2) unscheduled outages, or to supply power while maintenance is performed or repairs are made to the primary power supply; and (3) if it is limited to operate 100 hours or less per calendar year for non-emergency purposes. An engine shall not be considered to be an emergency standby engine if it is used: (1) to reduce the demand for electrical power when normal electrical power line service has not failed, or (2) to produce power for the utility electrical distribution system, or (3) in conjunction with a voluntary utility demand reduction program or interruptible power contract.

EPA: U.S. Environmental Protection Agency.

Exhaust Control: device or technique used to treat an engine's exhaust to reduce NO_x, VOC, or CO emissions, and includes, but is not limited to, catalysts, afterburners, reaction chambers, and chemical injectors.

Original Equipment Manufacturer (OEM) Tier 4F Compliant Engine – An engine that meets emission levels equivalent to EPA Tier 4F certification levels and where engine production and retrofitting of exhaust controls have been conducted by the same manufacturer.

Retrofit Engine: The addition of air pollution control equipment to the exhaust stream or physical modification to the combustion system (excluding adjustment) of a stationary internal combustion engine in order to meet the regulatory requirements.

Selective Catalytic Reduction (SCR) System: An exhaust after treatment device that injects DEF into the exhaust stream of an engine. The injected DEF reacts with exhaust gases to reduce NO_x emissions into water and nitrogen gas.

3rd Party Retrofit Tier 4F Compliant Engine: An engine that meets emission levels equivalent to EPA Tier 4F certification levels and where engine production and retrofitting of exhaust controls have been conducted by different manufacturers.

VI. Guidance

Monitoring and Source Testing for OEM Tier 4F Compliant Engines:

OEM compliant engines have few changes made to them during the retrofitting process. In most instances, the only difference between a certified and compliant OEM engine is the removal of the inducement system, so that the engine can continue to operate when certain error flags are triggered. Therefore, compliant engines that are retrofitted by the original manufacturer will be treated the same as Tier 4F certified engines. Consequently, no monitoring or source testing will be required for OEM Tier 4F Compliant Engines.

Monitoring and Source Testing for 3rd Party Retrofit Tier 4F Compliant Engines:

Compliant engines that are retrofitted by a 3rd party manufacturer or system integrator have the highest probability for non-compliance due to manufacturing and structural differences as well as viability in the types of emission control technologies and engine management technologies used. Therefore, more strenuous monitoring and source testing will be required.

Rule 4702 (Internal Combustion Engines) applies to internal combustion engines rated greater than 25 bhp that require a Permit to Operate (PTO). While emergency standby engines are typically exempt from this rule, the sections that specifically apply to the monitoring and source testing of all compression-ignited engines will be used as guidance to form the appropriate source testing and monitoring conditions for Tier 4F Compliant Engines.

Initial Source Testing:

Initial source testing will be required for NO_x, CO, VOC, and PM₁₀ to determine if the Third Party Retrofit Tier 4F Compliant Engine meets the requisite EPA Tier 4F emission requirements for the applicable horsepower range. No follow up source testing will be required, as emergency IC engines operate far less than full-time IC engines. Source testing for PM₁₀ for 3rd party retrofit Tier 4F compliant engines will be required if the proposed engine triggers BACT for PM₁₀ and if the proposed engine is retrofitted with a non-CARB certified DPF or other uncertified after-treatment device that filters particular matter. Engines that would trigger BACT for PM₁₀ without an emission control device (DPF) must conduct an initial source test for PM₁₀ even if they do not trigger BACT with the emission control device in place. In any case, engines equipped with a CARB-certified DPF will not be required to source test for PM₁₀ emissions. ATC permit conditions:

- *{109} Source testing shall be conducted using the methods and procedures approved by the District. The District must be notified at least 30 days prior to the source test, and a source test plan must be submitted for approval at least 15 days prior to testing. [District Rule 1081]*
- *{110} The results of each source test shall be submitted to the District within 60 days thereafter. [District Rule 1081]*

- *Initial source testing of the engine shall be conducted within 60 days of initial start-up of the engine to demonstrate compliance with the NOx, CO, VOC and PM10 emission limits. [District Rule 2201]*
- *Emissions source testing shall be conducted with the engine operating either at conditions representative of normal operations or conditions specified in the Permit to Operate. An appropriately-sized resistance load bank (or equivalent) shall be used during the emissions source testing to ensure the engine is operating at load conditions representative of normal operations. [District Rules 1081 and 2201]*
- *The percent load, engine output, and stack gas volumetric flow rate shall be used to convert engine emissions to a mass basis (g/bhp-hr). [District Rules 1081 and 2201]*
- *For emissions source testing, the arithmetic average of three 30-consecutive-minute test runs shall apply. If two of three runs are above an applicable limit, the test cannot be used to demonstrate compliance with an applicable limit. NOx, CO, PM10, and VOC concentrations shall be reported in g/bhp-hr. [District Rules 1081 and 2201]*
- *{Modified 3210} The following test methods shall be used: NOx (ppmv) - EPA Method 7E or ARB Method 100, CO (ppmv) - EPA Method 10 or ARB Method 100, stack gas oxygen - EPA Method 3 or 3A or ARB Method 100, and VOC (ppmv) - EPA Method 18, 25A or 25B, or ARB Method 100. [District Rules 1081 and 2201]*
- *Source testing to measure PM10 shall be conducted using EPA Method 5 (front half) (gr/dscf) or EPA Method 201A/202 (gr/dscf). Should it be determined that another set of test methods is more appropriate for use in demonstrating compliance with the minimum control efficiency requirements, such test methods shall be approved by the District prior to initial source testing. [District Rule 1081]*

Monitoring:

NOx and VOC Emissions:

For fulltime engines, Rule 4702 states that the owner/operator is required to use a portable analyzer to take NOx and CO emission readings and oxygen concentration readings to verify compliance with emission requirements during each calendar quarter. However, since emergency IC engines operate far less frequently than full time IC engines, less frequent monitoring is appropriate. A monitoring schedule of every 12 months using a portable analyzer will be used to monitor Third-Party Retrofit Tier 4F Compliant Engines.

Monitoring of VOC emissions will not be required, as there is no practical method to periodically monitor VOC emissions from an internal combustion engine. Monitoring of compliant CO emissions will give assurance that VOC controls are also operating properly.

For IC engines, monitoring using a portable analyzer is often reported in ppmv corrected to 15 percent oxygen. In order to comply with the emission requirements listed in grams/bhp-hr, exhaust flow and power output values are required to convert the portable analyzer values from ppmv to grams/bhp-hr. The applicant may demonstrate the operating horsepower at the source tested power level using any method approved by the APCO and EPA. The following conditions should be included on the PTO:

- *The permittee shall monitor and record the stack concentration of NO_x, CO, and O₂ at least once every 12 months using a portable emission monitor that meets District specifications. Monitoring shall be performed not less than once every month for 12 months if 2 consecutive exceedences of the emission limit(s) are observed during monitoring. Monitoring shall not be required if the engine is not in operation, i.e. the engine need not be started solely to perform monitoring. Monitoring shall be performed within 5 days of restarting the engine unless monitoring has been performed within the last month if on a monthly monitoring schedule. [District Rule 2201]*
- *The permittee shall demonstrate the operating horsepower at the source tested power level using any method approved by the APCO and EPA. The permittee shall document typical operating parameters, loading, and duty cycle during the initial source test and subsequent monitoring. [District Rule 2201]*
- *{Modified 2993} If either the NO_x or CO concentrations corrected to 15% O₂, as measured by the portable analyzer, exceed the allowable emission concentration, the permittee shall return the emissions to within the acceptable range as soon as possible, but no longer than 8 hours after detection. If the portable analyzer readings continue to exceed the allowable emissions concentration after 8 hours, the permittee shall notify the District within the following 1 hour, and conduct a certified source test within 60 days of the first exceedance. In lieu of conducting a source test, the permittee may stipulate a violation has occurred, subject to enforcement action. The permittee must then correct the violation, show compliance has been re-established, and resume monitoring procedures. If the deviations are the result of a qualifying breakdown condition pursuant to Rule 1100, the permittee may fully comply with Rule 1100 in lieu of performing the notification and testing required by this condition. [District Rule 2201]*
- *{Modified 2994} All portable analyzer emission readings shall be taken with the unit operating either at conditions representative of normal operations or conditions specified in the permit-to-operate. An appropriately-sized resistance load bank (or equivalent) shall be used during the portable analyzer monitoring to ensure the engine is operating at load conditions representative of normal operations. The analyzer shall be calibrated, maintained, and operated in accordance with the manufacturer's specifications and recommendations or a protocol approved by the APCO. Emission readings taken shall be averaged over a 15 consecutive-minute period by either taking a cumulative 15 consecutive-minute sample reading or by taking at least five (5) readings, evenly spaced out over the 15 consecutive-minute period. [District Rule 2201]*

PM10 Emissions:

A DPF is expected to operate properly so long as it is properly sized for the engine application and it is maintained according to manufacturer recommended procedures and frequencies for inspection, cleaning, and replacement. The following conditions should be included on the Permit to Operate to ensure compliance for units that utilize a DPF:

- *The diesel particulate filter (DPF) shall be operated and maintained according to the DPF manufacturer's specifications, procedures, and recommended inspection and cleaning frequencies. [District Rule 2201]*

Recordkeeping:

The following conditions should be included on the Permit to Operate to ensure compliance:

- *The permittee shall maintain an engine operating log to demonstrate compliance. The engine operating log shall include, on a monthly basis, the following information: total hours of operation, type of fuel used, maintenance or modifications performed, monitoring data, compliance source test results, and any other information necessary to demonstrate compliance with the permit limits. [District Rules 1070 and 2201]*
- *The permittee shall maintain records of: (1) the date and time of NOx, CO, and O2 measurements, (2) the O2 concentration in percent and the measured NOx and CO concentrations corrected to 15% O2, (3) the stack volumetric flow rate, in standard cubic meter per hour, dry basis, (4) the emission rate of NOx and CO, converted to g/bhp-hr (5) make and model of exhaust gas analyzer, (6) exhaust gas analyzer calibration records, and (7) a description of any corrective action taken to maintain the emissions within the acceptable range. [District Rules 1070 and 2201]*
- *The permittee shall maintain records of: (1) the date and time of DPF inspection, and (2) the date and time of DPF cleaning. [District Rules 1070 and 2201]*
- *{3465} Records shall be retained on-site for a period of at least five years and made available for District inspection upon request. [District Rule 2201]*